

In claim 22, line 14 "angle" has been deleted in view of the Examiner's comments that "a camera means... aligned at a predetermined angle from said slit lamp means" is indefinite because of the angle.

Claim 23 has been amended to recite the features of projecting means and capturing means in view of the Examiner's comments that the phrase "with the projecting and capturing occurring during rotation about the predetermined of axis" is unclear. Claims 24 and 25 have been similarly amended.

In claim 27, the passage has been deleted beginning on line 13 and extending to line 17 which reads ", said first camera... contacts the eye" in view of the Examiner's comment that the image detection axis is confusing. Also, in claim 27, lines 22-23, "for rotation with the housing" has been deleted to more clearly describe the beam splitter cube.

Further, in claim 27, lines 24-25, the feature "a pair of fixation points" has been changed to "a pair of fixation targets mounted in the housing" in view of the Examiner's comments that the original language is undefined, and in view of the language used in the specification on page 13 lines 16+.

In claim 30, the term "reflecting beam splitter" has been amended so as to correctly identify "beam splitter cube" in

accordance with the Examiner's rejection that the original language has no antecedent basis.

Also, in claim 51, the word "read" has been changed to -- recorded--.

Finally, in claims 28 and 29, the language "generally rectangular" has been deleted in view of the Examiner's comments that such language resulted with the claim being indefinite.

In view of all the changes noted above, applicant's respectfully solicit reconsideration and withdrawal of the rejections under 35 USC §112(second paragraph).

Claim 23 stands rejected under 35 USC §102(b) as being anticipated by Sasaki et al; claims 50 and 21 stand rejected under 35 USC §102(e) as being anticipated by Snook; claims 1, 5 and 7-11 stand rejected under 35 USC §102(b) as being anticipated by Papritz and also Kawase; claims 1, 5, 7-11, 19, 45 and 46 stand rejected under 35 USC §103(a) as being unpatentable over Karasawa; claims 12, 47-49 stand rejected under 35 USC §103(a) as being unpatentable over Karasawa et al; claims 24-26 stand rejected under 35 USC §103(a) as being unpatentable over Sasaki et al; claims 2-4 stand rejected under 35 USC §103(a) as being unpatentable over Kawase or Papritz in view of Knopp et al; claims 6 and 22 stand rejected under 35 USC §103(a) as being unpatentable over Kawase or Papritz

in view of Knopp et al as applied to claim 1-5, 7-11 and further in view of Snook; claims 16, 18, 27, 30-34, 37, 38, 51 and 52 stand rejected under 35 USC §103(a) as being unpatentable over Kawase or Papritz in view of Knopp et al; and finally claims 28 and 29 stand rejected under 35 USC §103(a) as being unpatentable over Kawase or Papritz in view of Knopp et al as applied to claim 27, 30-34, 37, 38, 51, 52 and further in view of Snook. These rejections are respectfully traversed.

Claim 1 has been amended to include the subject matter from original claim 2 of an alignment determining assembly; in particular, that the alignment determining assembly comprises a first target means and a second target means, each of which is located on a first predetermined axis, with the first target means being closest to the eye, so that visual alignment of the first target means with the second target means results in the eye being aligned along a second predetermined axis. Applicant's submit that amended claim 1 is seen to be allowable over the cited prior art, as is described in detail below.

Claim 1 has been rejected based on Papritz and Kawase under 102(b) and Karasawa et al under 35 USC §103(a). Claim 2 has been rejected under 35 USC §103(a) over Kawase or Papritz in view of Knopp et al. In responding to this rejection, applicants have incorporated the feature of the alignment determining assembly from claim 2 into claim 1, and applicants have amended the present

application in accordance with 35 USC §120 as a continuation-in-part of Knopp et al (5,474,548). For these reasons, applicants respectfully solicit reconsideration and allowance of amended claim 1 together with claims 3-12, 16, 18, 19, 45 and 47-49 which are dependent either directly or indirectly from claim 1.

The following are some additional comments so as to clarify the features of the claims dependent from claim 1.

With respect to the rejection of claims 12, 47-49 under 35 USC §103 over Karasawa et al, the Examiner has indicated that "applicant admits on page 1, line 5+ and page 16, lines 18+ of the specification that the apparatus with a computer assisted analysis (processing means) and display of derived cornea shapes (in three dimensional structure) is known in the art. Therefore, it would have been obvious to one ordinarily skilled in the art to use processing means for providing a three-dimensional representation, as is conventional". However, contrary to the Examiner's position, applicants submit that a disclosure of the broad concept of "computer assisted analysis" and "display of derived cornea shapes", even if made, does not teach or suggest the specific limitations of applicants processing means as claimed. In particular, in claim 12 the limitation is set forth "processing means for providing said capturing means in at least one pre-defined position and storing said images of said eye captured by said capturing means corresponding to the at least one pre-defined

position". In claim 47 the additional limitation is set forth that the processing means provides the capturing means in a plurality of pre-defined positions. In claim 48 it is set forth still an additional limitation that the plurality of pre-defined positions includes a first and last position, with the projecting means being rotated substantially 180 degrees from when the capturing means is in the first position to when the capturing means is in the last position. Finally, claim 49 sets forth the limitation that the processing means includes means for providing a three-dimensional representation of the stored images for analysis. Applicants submit that such foregoing limitations are neither taught or made obvious in view of that known in the art. Also, it does not appear to be possible to obtain a three dimensional representation from the Karasawa apparatus since there is no means disclosed of establishing a common reference point as part of the means for providing a three-dimensional representation, which is required for constructing individual two dimensional pictures into three dimensional representations. In the present invention, the means for establishing the common reference point is the second camera in connection with the first camera.

In addition, with respect to the rejection of claims 16 and 18, applicants respectfully disagree with the Examiner that it would have been obvious to one of ordinary skill in the art "to choose the limbus [as] a predetermined reference point on the eye as is conventional" and "using a camera as capturing means [for]

such a predetermined reference point on the eye is easily recognized by an artisan in measuring movement of the eye". Specifically, it appears for the following reasons that the Examiner has used hindsight in making the present rejection by basing the rejection solely on the applicants' disclosure.

First, applicants wish to clarify for the Examiner the specific language in applicants' disclosure. Specifically, the Examiner sets forth in the office action that "applicant admits on page 22, line 5+ of the specification that the position of the limbus is known", however, applicants clarify that such language does not in fact appear in applicants' specification. Specifically, applicants specification on page 22, line 9+, with respect to the limbus actually reads:

In the preferred embodiment, position sensing camera 37 is located at a distance from the optical axis such that only a portion of the image of the eye falls upon the detecting CCD array, that portion being approximately one quadrant of the generally circular image representing the structure known as the limbus, formed by the juncture of the iris and the sclera (whites) of the eye as shown in View A. (emphasis added)

On the contrary, with respect to the position of the limbus, applicants' specification actually sets forth that the position of the limbus is not known but rather must be calculated, as described on page 22, line 18+:

The position of a portion of the limbus, or of the entire limbus, with respect to the instruments optical axis is determined using edge finding techniques similar to those employed to determine the surfaces of the

cornea as is discussed above.

Second, there is no disclosure in any cited art of a second capturing means or camera. As discussed in applicants' specification, the second capturing means or camera is incorporated for two reasons. The first is to see where the slit of light fell across the eye on each of the positions at which images were obtained. As discussed earlier, this function is of paramount importance since it must be known where the two dimensional data were taken with respect to each other in order to correctly form a three dimensional representation. The recorded data cannot be combined into a correct model without this information. The second reason is to record the position of the eye in the plane perpendicular to the patients line of sight, so that a correction for eye motion in that plane can be performed.

For the foregoing reasons, applicants respectfully solicit reconsideration and allowance of claims 16 and 18, together with claims 27-30, 34, 37, 38, 51-52 which have also been rejected for the same reason.

In addition, with respect to claim 30 there is no disclosure seen in the cited art of a filter between the beam splitter cube and the slit lamp, which is in place for two reasons: first, to permit the patient to look directly at the slit without discomfort and without contraction of the pupil; and second, to prevent the patient from seeing the slit above an artificial background light,

that is provided so that the patient's view will not be distracted by the rotation of the slit.

With respect to the Examiner's rejection of claim 19, the Examiner has indicated that "Karasawa et al's should include a motor for rotating the slit illumination system and the recording optical system" (emphasis added). However, applicants submit that the Examiner's rejection is not supported by the teachings of Karasawa et al, which does not appear to disclose use of a motor for rotating the slit illumination system and the recording optical system, but rather it appears in Karasawa et al that rotation of the slit illumination system and the recording optical system is manual (Col. 2, line 57- Col. 3, line 15).

With respect to the rejection of claims 45 and 46, the Examiner has indicated that a head rest is known in the art of the ophthalmic apparatus with a slit lamp. However, applicants submit that the Examiners broad statement that a head rest is known, assuming it is accurate, does not teach applicants specific head rest as claimed. In applicants' claim 45 as amended (claim 46 incorporated into claim 45) it is set forth that the head rest includes aligning means comprising adjustment means for varying a vertical and a horizontal position of the eye with respect to the apparatus. Applicants submit that no art has been cited of record which discloses or suggests applicants foregoing headrest as claimed.

Applicants' next independent claim is claim 22, which stands rejected over Kawase or Papritz in view of Knopp et al, and further in view of Snook (5,512,965).

As noted above, applicants have amended the present application so as to be continuation-in-part application of Knopp et al and, for this reason, respectfully solicits reconsideration and allowance of claim 22.

Moreover, enclosed is an affidavit under 37 CFR §1.131 swearing behind the Snook reference and, for this additional reason, applicants respectfully solicit reconsideration and allowance of claim 22. For the Examiner's reference, Figs. 1 and 14 in Snook are disclosed in U.S. Patent No. 5,512,965, which was filed on October 26, 1994, but are not disclosed in the Snook priority patent application serial no. 80,497, filed on June 24, 1993, now U.S. Patent No. 5, 512,966.

Moreover, applicants respectfully disagree with the Examiner's position that "use slit lamp means or convex slit lamp means for projecting a slit image on the eye is a matter of engineering choice because the results of imaging the anterior structure of the eye are substantially the same when using slit lamp means or convex slit lamp means as claimed by applicant". Rather, as set forth in detail in applicants' specification, on page 20, line 18-page 21, line 12, and in applicants' amendment filed April 15, 1996 (Paper

No. 4), on page 10, line 4 through to page 12, line 15, the results of imaging the anterior structure of the eye are in fact different when using slit lamp means or convex slit lamp means.

Furthermore, applicants submit that the cited art also does not teach or suggest applicants' claimed motor means connected to a stepper means for rotating the projecting means and camera means.

For the foregoing reasons, applicants respectfully solicit reconsideration and allowance of claim 22. Further, applicants also respectfully request reconsideration and allowance of claim 6 for the same reasons.

Claim 23 is applicants next independent claim and stands rejected under 35 USC §102(b) by Sasaki et al. In particular, the Examiner has indicated that the limitations in claim 23 are shown in Sasaki et al's Fig. 1 and the abstract. However, upon review of Sasaki et al's Fig. 1 and the abstract, applicants submit that there does not appear to be any teaching or suggestion of applicants' features of aligning the eye along a predetermined axis and rotation of the projecting means and the capturing means about the predetermined axis. Specifically, Sasaki is seen to merely disclose rotating of the slit beam (projecting means) and not rotation of a projecting means and a capturing means. In particular, in Sasaki et al under the heading "PURPOSE", in line 3 it is set forth: "means for rotating the slit beam around the apex

of the cornea" and under the heading "CONSTITUTION" in lines 5-7 is set forth: "Next, the laser beam is turned in its direction by a prism 6 through a image rotator 5 and subsequently condensed to an anterior part by a condensing lens 7". There is no disclosure seen in Sasaki that the CCD camera (capturing means) is rotatable.

With respect to applicants' claimed feature of aligning the eye along a predetermined axis, applicants submit that only alignment of the laser beam is seen to be disclosed in Sasaki et al under the heading "CONSTITUTIONAL", lines 1-2: "After alignment is finished, laser beam is allowed to irradiate." In particular, the forgoing sentence is constructed so that the alignment be of the laser beam.

For the foregoing reasons, applicants respectfully solicit reconsideration and allowance of claim 23 together with claims 24-26 dependent therefrom.

Furthermore, with respect to claims 24-26, applicants respectfully solicit reconsideration and allowance for the same reasons recited above with respect to claims 12, 47-49.

Applicants next independent claim is claim 27 which stands rejected under 35 USC §103(a) as being unpatentable over Kawase or Papritz in view of Knopp et al. Applicants respectfully solicit reconsideration and allowance of this claim for the same reasons

recited above with respect to claims 1 and 2 as well as claims 16 and 18. Moreover, applicants submit that the prior art is not seen to teach or suggest a beam splitter cube located in the housing adapted to translate a reflected image of a pair of fixation targets through 90 degrees.

Applicants also respectfully solicit reconsideration and allowance of dependent claims 28-34, 37, 38 and 51, 52 for these same reasons. In addition, with respect to claims 28 and 29, applicants respectfully solicit reconsideration for the same reasons recited above with respect to claims 6 and 22. Further, with respect to claim 32, there is no disclosure or suggestions seen in the cited art that the alignment assembly further include means for adjusting a position thereof along the first axis.

Claim 50 is applicants last independent claim which has been rejected under 35 USC §102(e) as being anticipated by Snook. As noted above, applicants have submitted an affidavit under 37 CFR §1.131, enclosed with this amendment, swearing behind the Snook reference and, for this reason, respectfully solicit reconsideration and allowance of claims 50 together with claim 21 dependent therefrom.

Claims 53 to 56 are newly added for consideration by the Examiner. Claim 53 is dependent from claim 1 and sets forth the feature that the apparatus further includes means for moving said

alignment determining assembly in a direction substantially parallel to said predetermined axis. Applicants submit that such feature is not seen taught in the cited art. In particular, as noted in applicants' specification on page 13, line 18 to page 14 line 6, the prior Knopp et al application (now 5,474,548) does not disclose that the alignment determining assembly is moveable.

Claim 54 is dependent from claim 23 and sets forth that the rotation of the capturing means and the projecting means is by a substantially identical angle about the predetermined axis. An illustration of this feature is shown in the specification on page 17, line 4+.

Claim 55 is dependent from claim 54 and sets forth that the capturing means includes a camera and a lens, with the positioning of the lens having its longitudinal axis perpendicular to an image detection axis extending between the eye and the lens, and the camera being positioned perpendicular to the image detection axis. An illustration of this of this feature is shown in the specification on page 19 and in Fig. 2.

Claim 56 is dependent from claim 23 and sets forth the additional steps of capturing a second image of a predetermined reference point on the eye and determining a position of the eye when capturing the second image as compared with the image captured of the eye. As noted above with respect to the rejection of claims


16 and 18, the cited art is not seen to teach or suggest the feature of capturing the second image of a predetermined reference point on the eye so as to compensate for eye movement.

In view of all that set forth above, applicants respectfully solicit reconsideration and allowance of the present application.

Respectfully submitted,

Date: May 16, 1997

Order No.: 0909



Paul A. Taufer
Registration No. 35,703
Paul & Paul
2900 Two Thousand Market St.
Philadelphia, PA 19103
(215) 568-4900